Take Amateur Radio into the class room with Space Activities

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Southern Africa Amateur Satellite Association

Easier said than done!

- The computer keyboard, the cell phone key pad are real opposition to amateur radio
- Amateur Radio must come up with better ideas than ‘talk to the world for free’ –
- Skype does!
- We must make Amateur Radio cool!
- Space, satellite, man on the moon, ISS

William Orr W6SAI

“The spirit of

a re

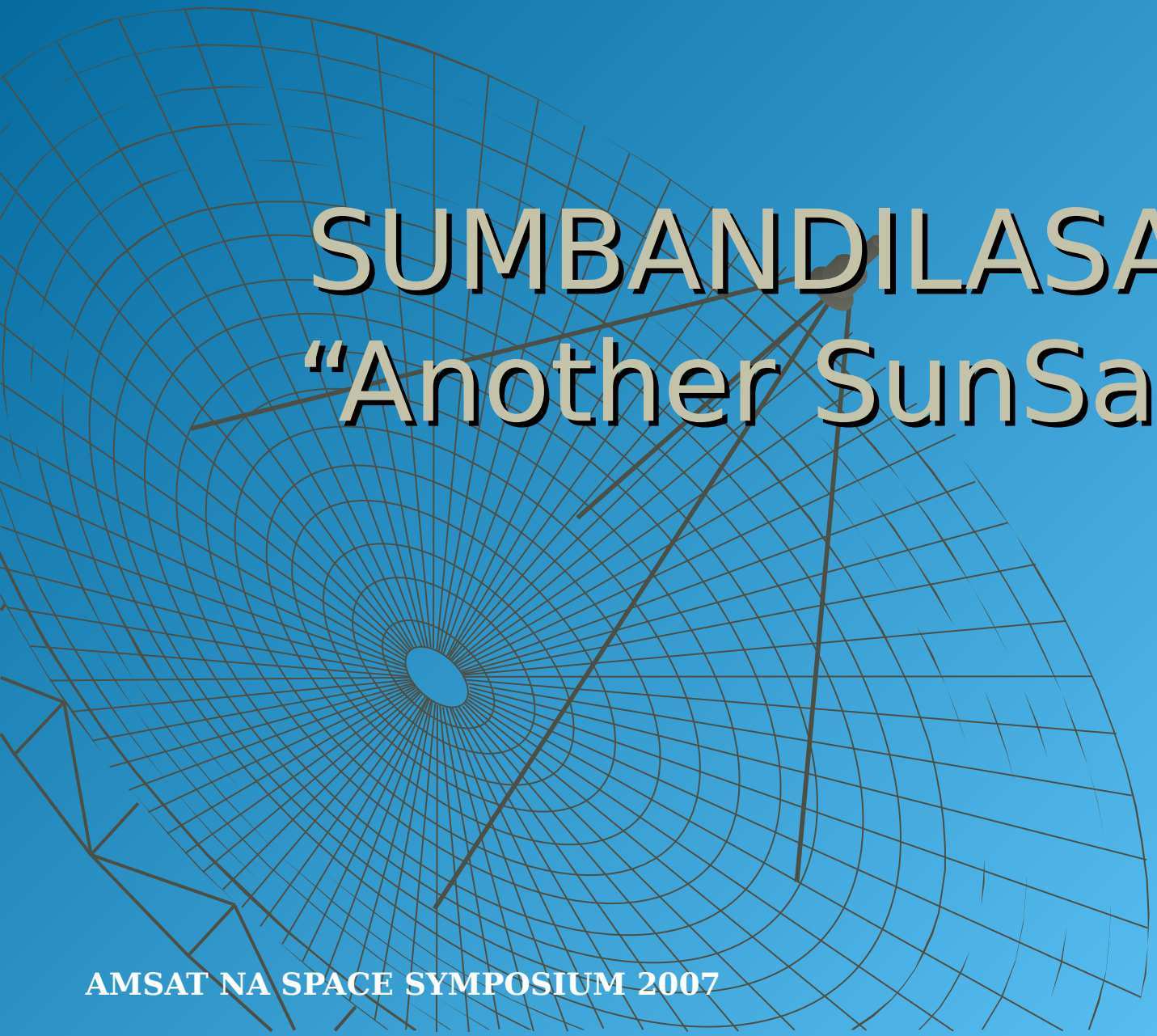
lies buried in every man’s soul.”

“Strike the spark and ignite the soul and the impossible is accomplished”

We have to strike the spark!

ARISS

SUMBANDILASAT
“Another SunSat”



Take a step back

SumbandilaSat

- SumbandilaSat is a LEO satellite
- Main payload is a remote sensing camera
- Secondary payload is a telecommunications system sponsored by the Department of Communication
- The other missions are the experimental payloads

SAT SUMBANDILA

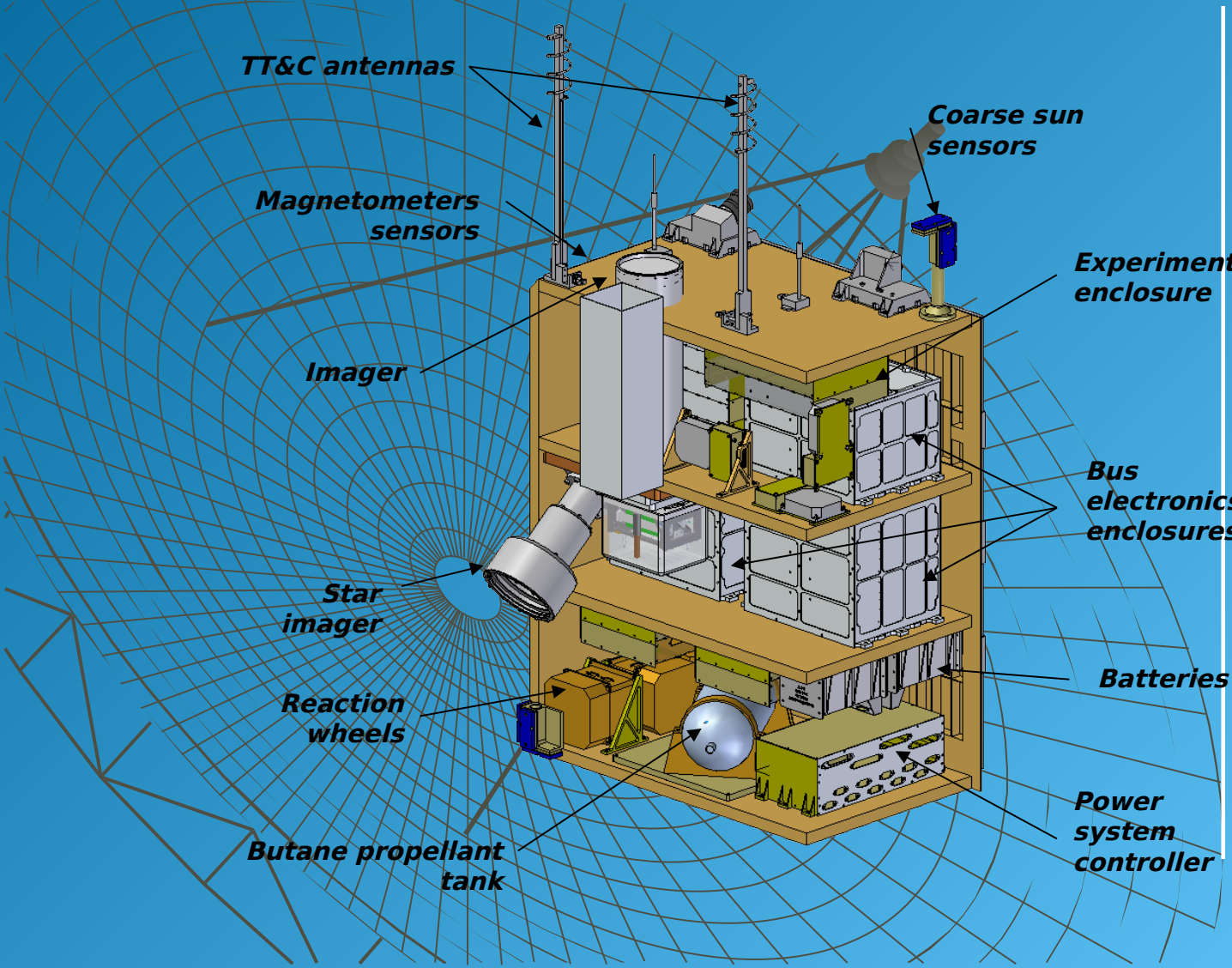
Mission Objectives

- The development and growth of people and institutions
- Providing satellite data for applications addressing the needs of society
- Understanding the modalities of a small satellite programme in order to inform the space policy process in South Africa

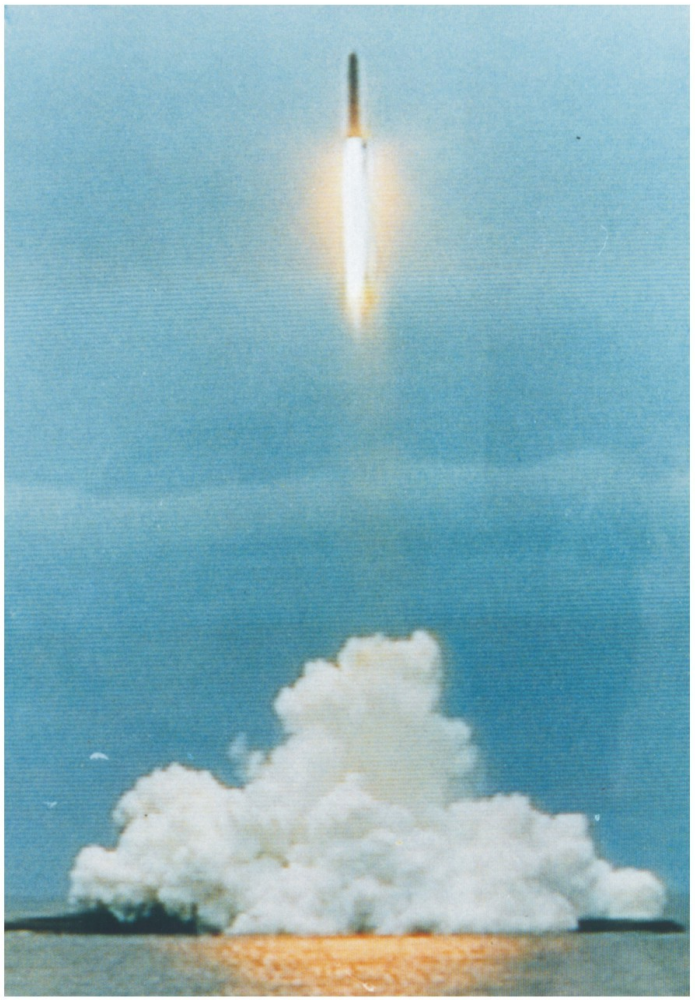
Satellite design

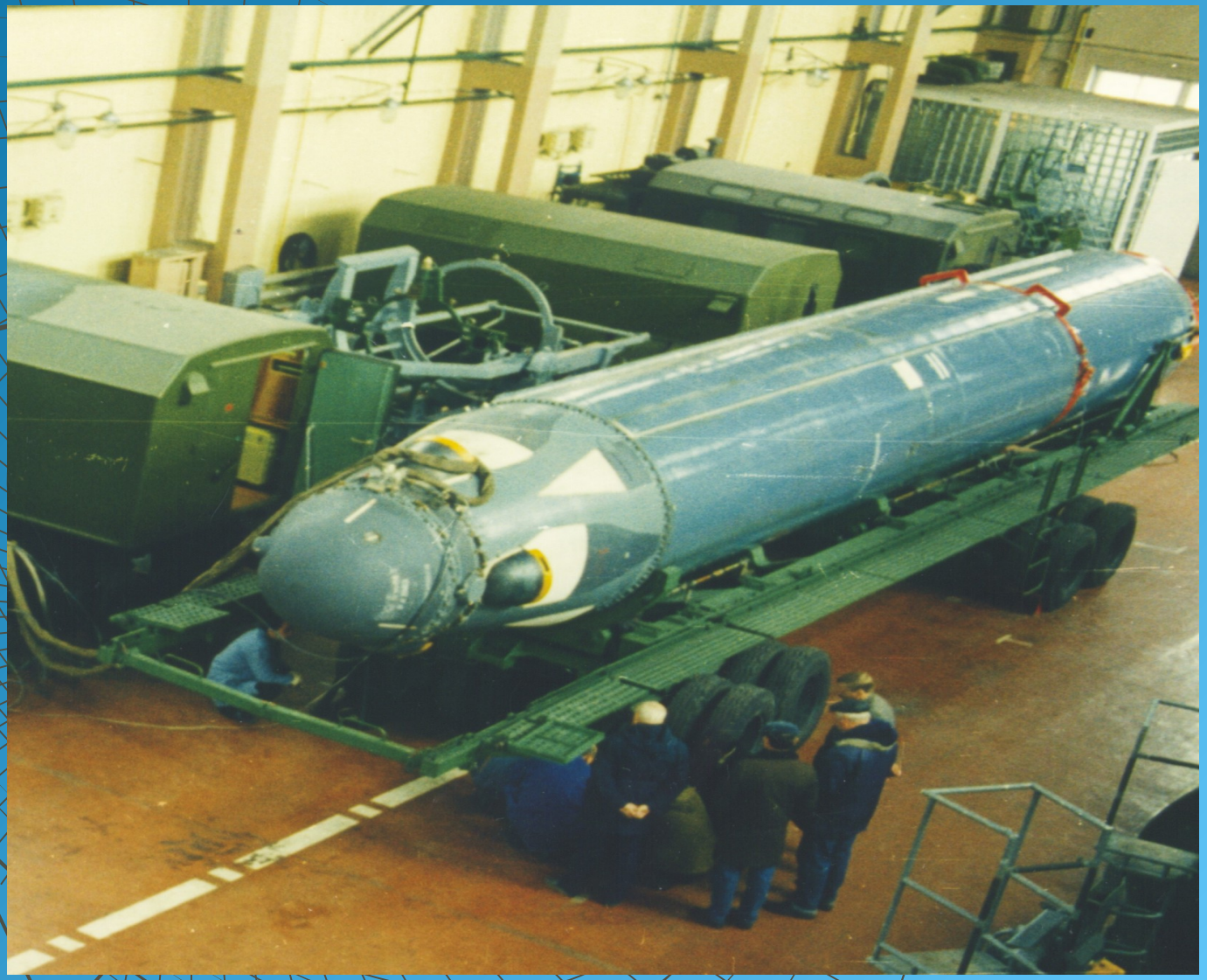
- System specification
  - Orbit height 510km over equator
  - Propulsion system: Butane
  - Weight 81kg

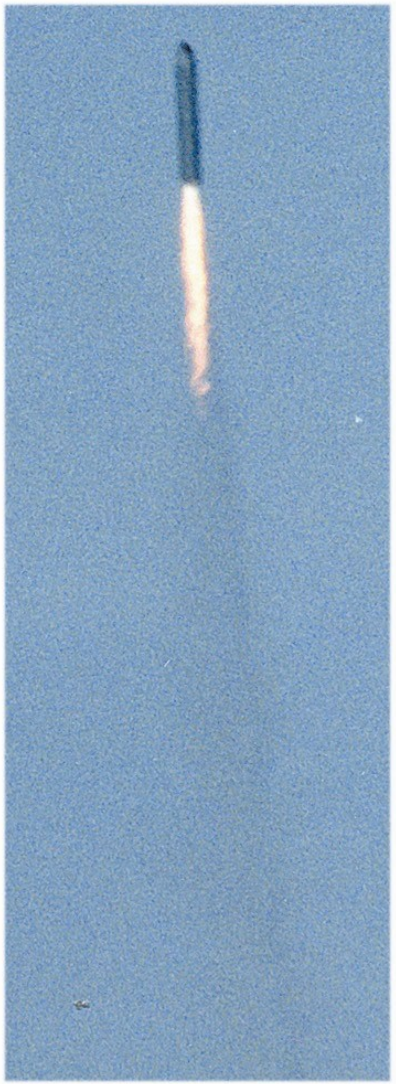
Satellite Layout

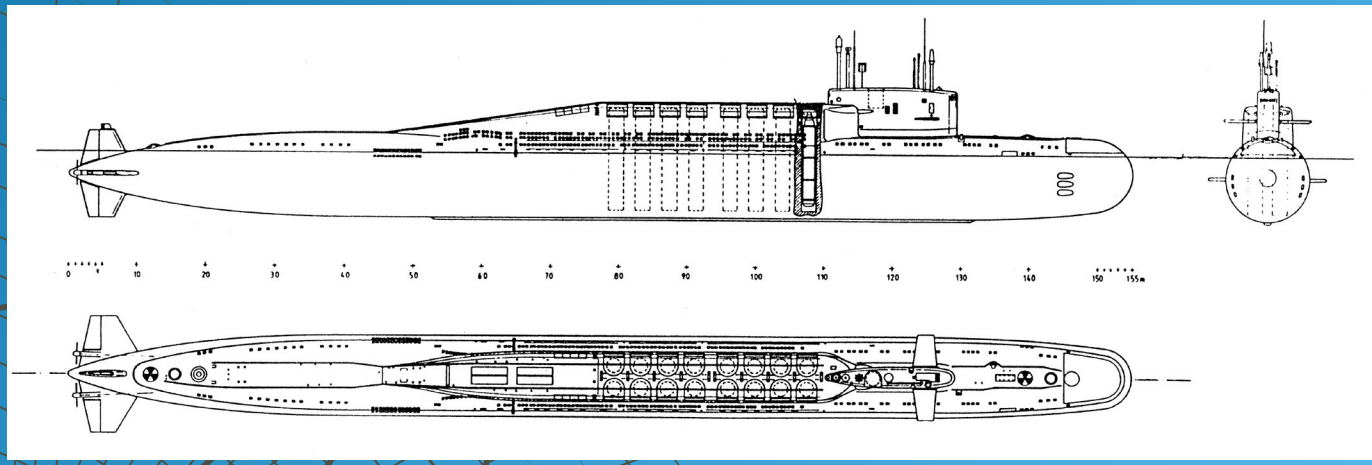


Planned Shtil 2.1 Launch

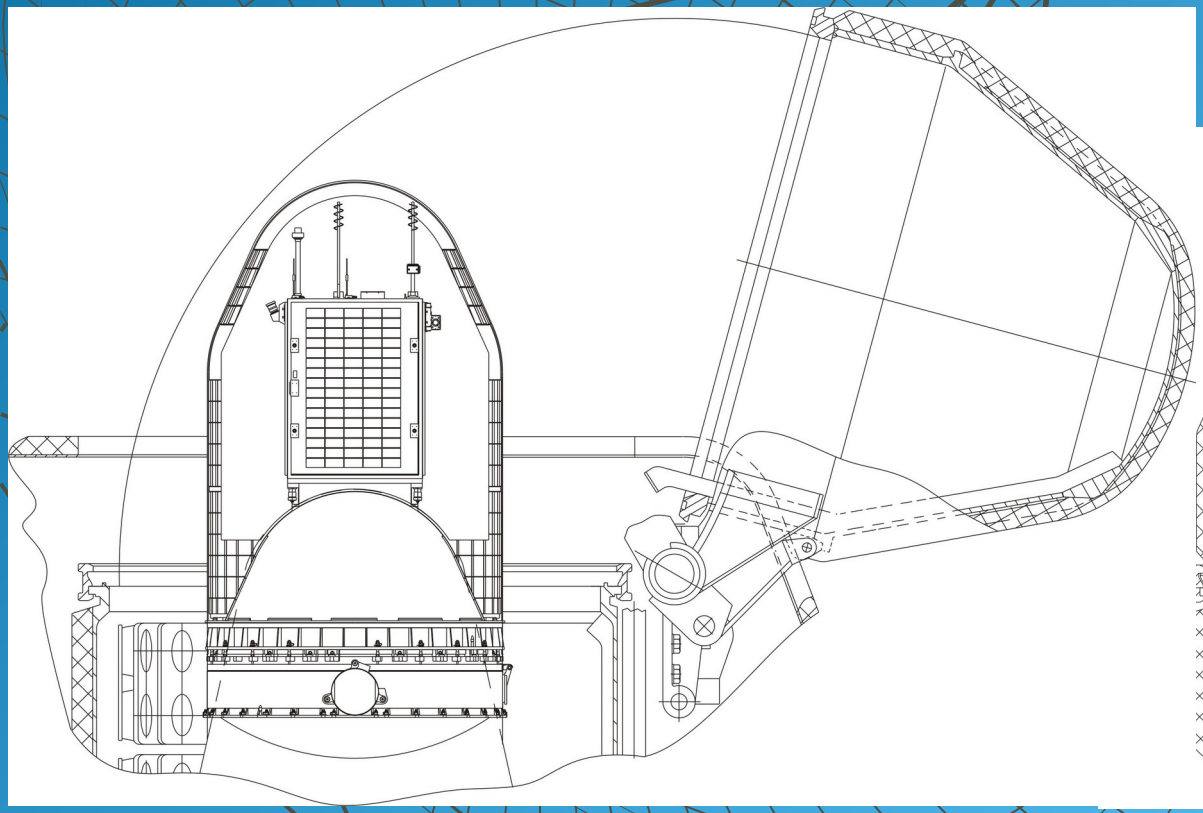


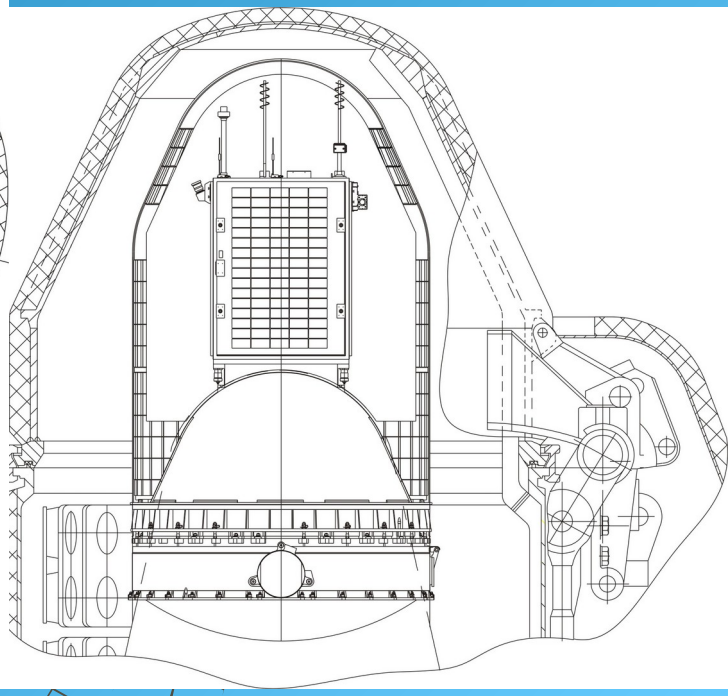





0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
155m

THE LAUNCH OF THE “SHTIL” LV





SUMBANDILA EXPERIMENTAL PAYLOADS

- University of KwaZulu-Natal
  - Very low frequency radio waves
- Nelson Mandela Metro University
  - Forced vibrating string
- Stellenbosch University
  - Software defined radio
  - Radiation experiment
- SAAMSAT
  - Radio Amateur transponder

Nelson Mandela Metropolitan University

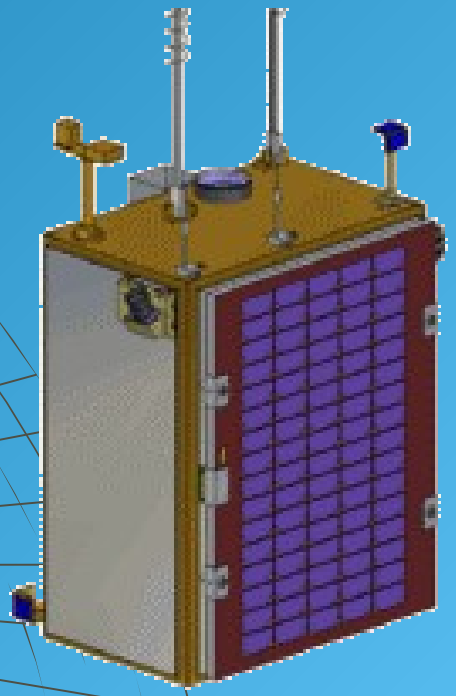
Forced vibrating string

- First micro gravity experiment on a SA satellite
- Comparison of vibration of a string in microgravity to line vibration of overhead telecommunication and power systems.
- In space the true vibration can be measured without having the dampening effect of air around
- The information will be useful in the study of overhead line behaviour and how to shorten spans.
- The University of Stellenbosch as devised a unique way of measuring the vibration of the string in all directions as well as the lengthening of the string. They call it their violin project

SA AMSAT Payload

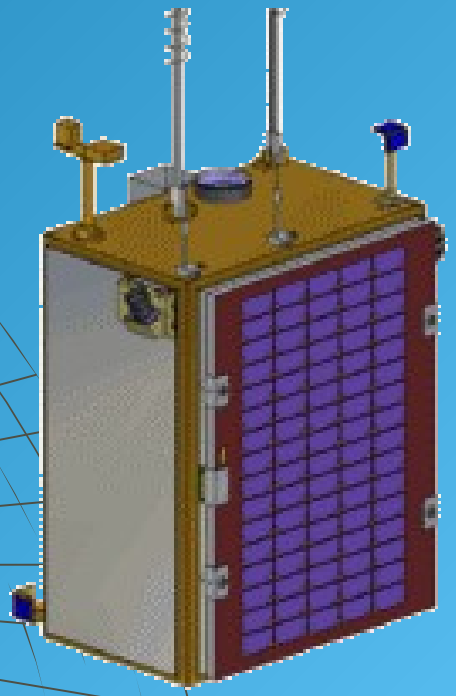
Objectives

- To promote an interest in SET amongst young people through their hands on involvement
- Create interest in satellite communication amongst the general amateur population

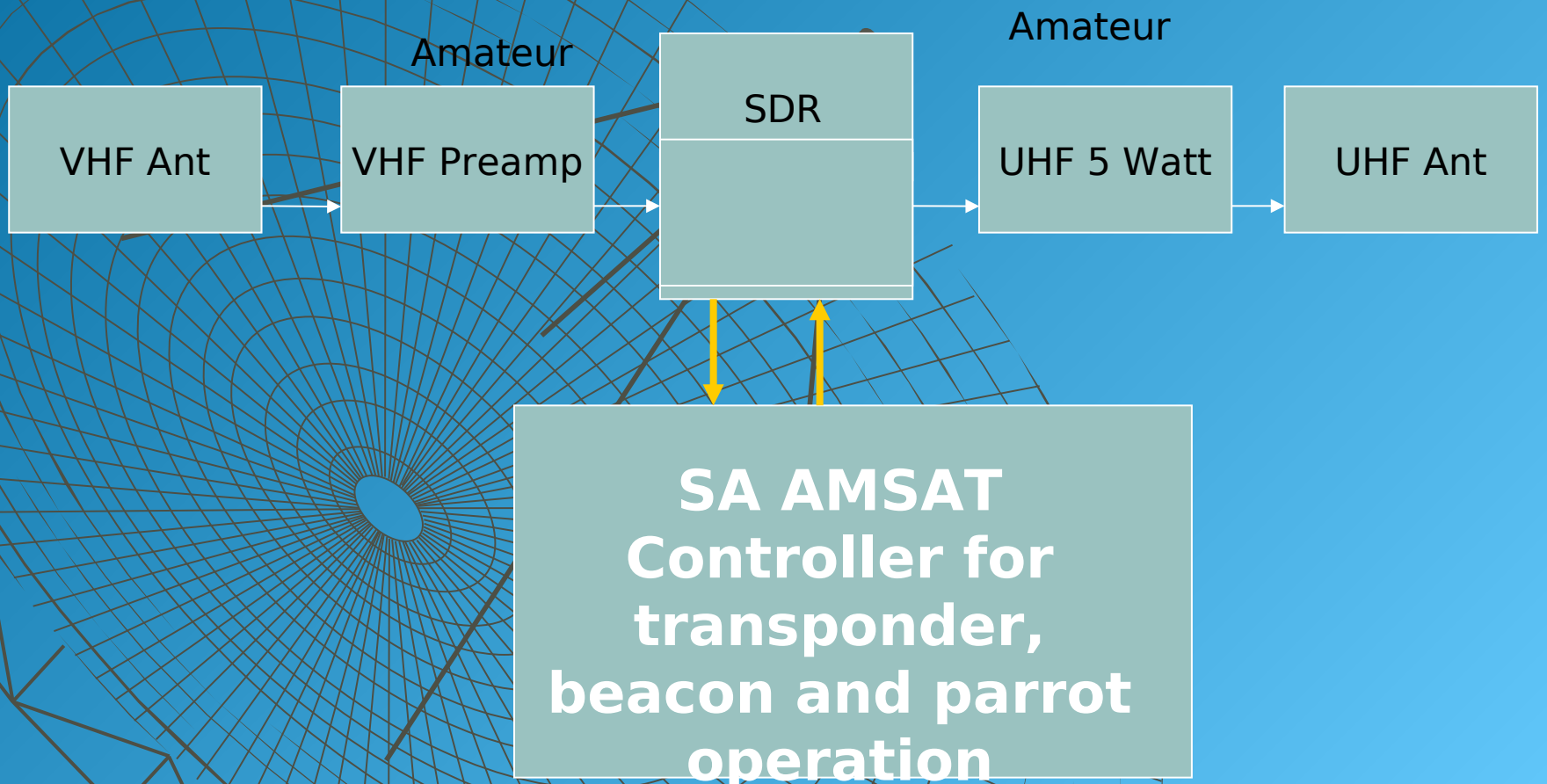


Payload Modes

- Mode VU FM transponder (the old mode J)
  - 2m Uplink
  - 70cm Downlink
- Parrot repeater
  - 20 seconds of audio
- Audio Beacon

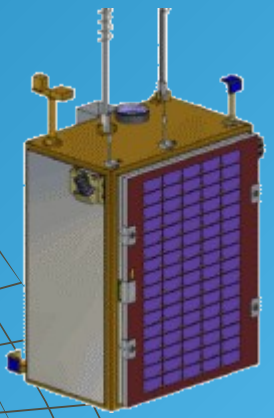


Systems


Amateur
Amateur
VHF Ant
VHF Preamp
SDR
UHF 5 Watt
UHF Ant
SA AMSAT Controller for transponder, beacon and parrot operation

Operation

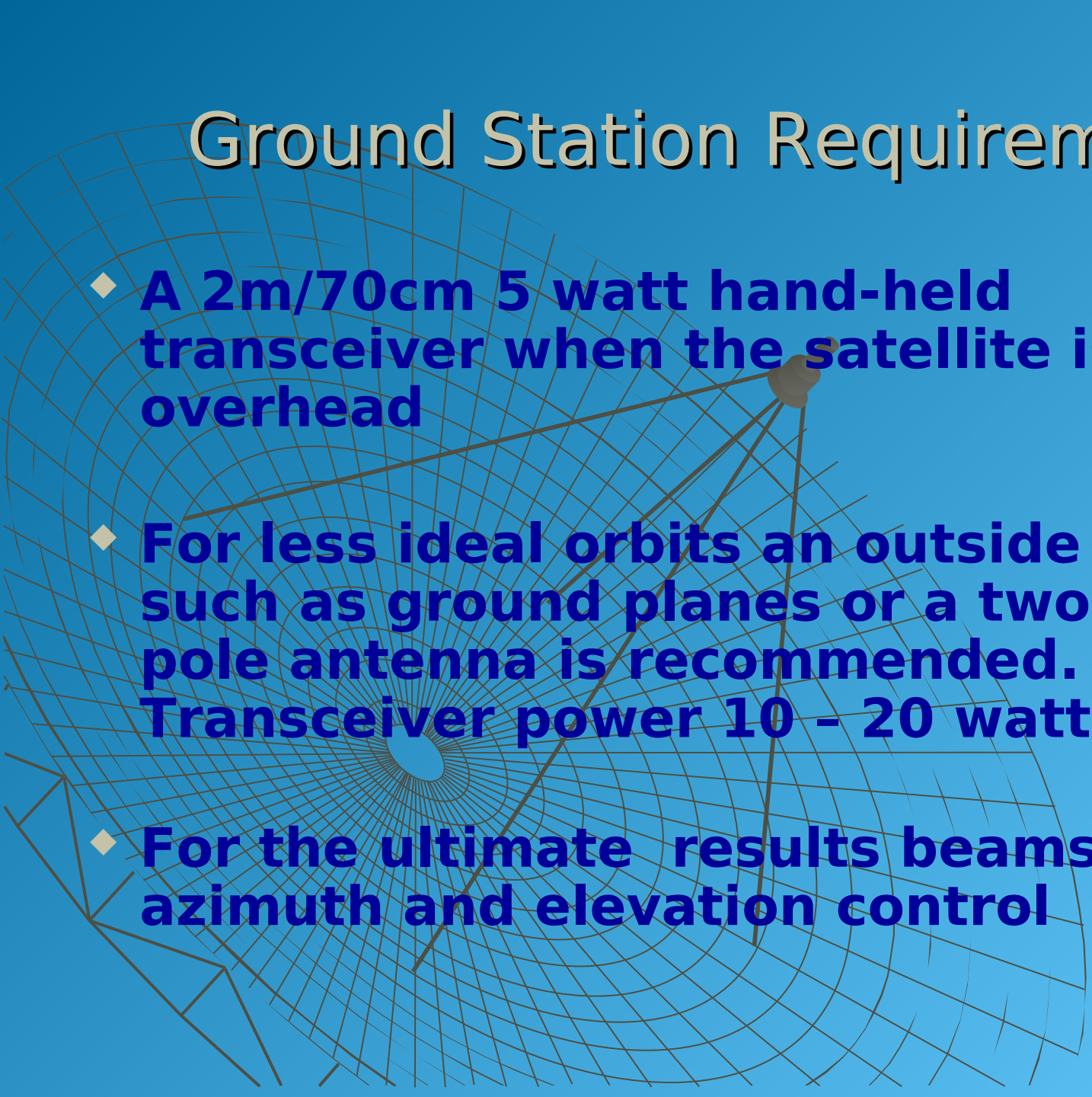
- On receipt of a “X” CTCSS tone the unit will command the satellite in the transponder mode
- On receipt of a “Y” CTCSS tone the control unit will command the satellite in the parrot mode
- If for a period no tones are received, the system will activate a voice beacon



Constructing Prototype

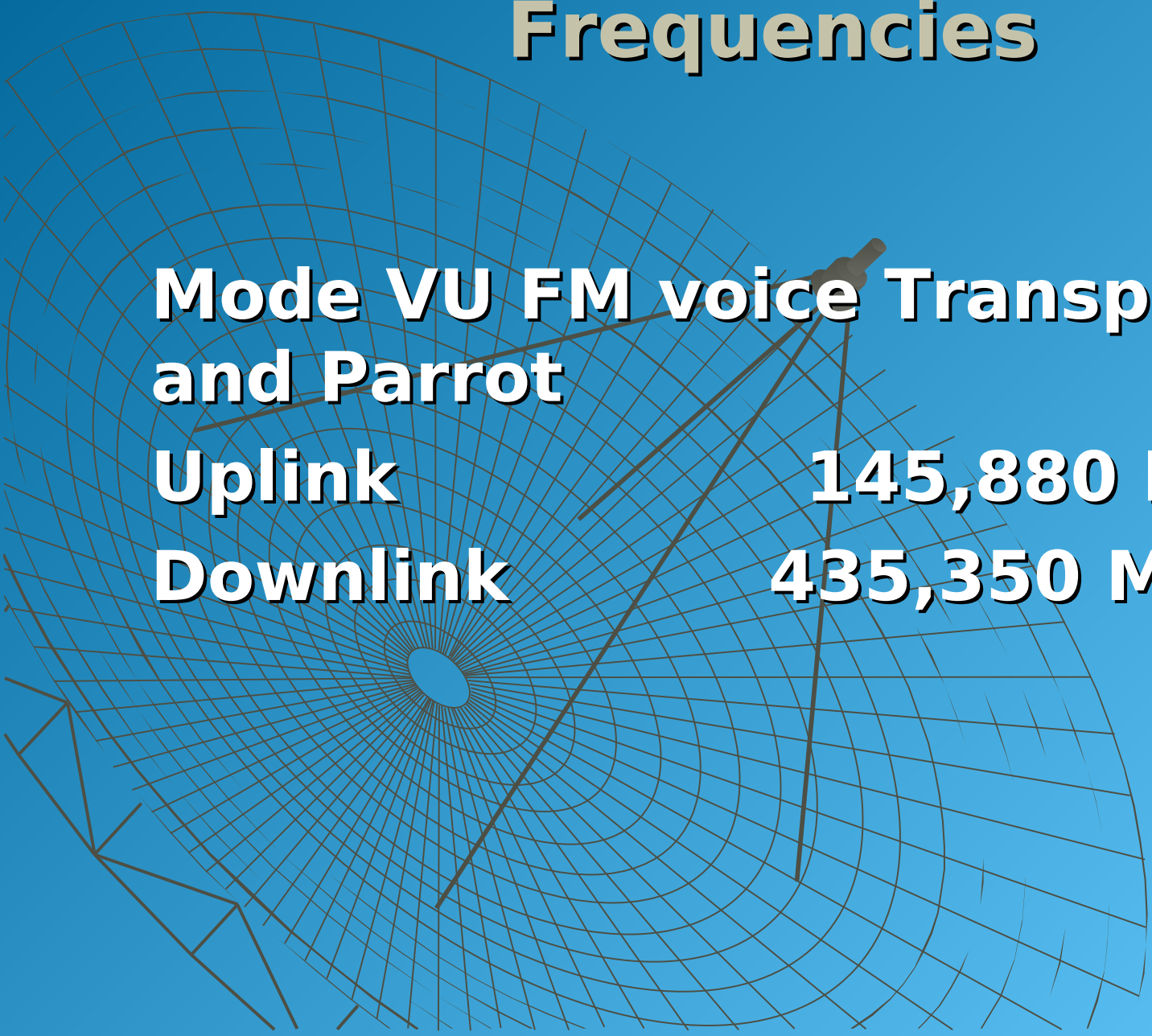
- Design: Andrew Roos ZS6AAA
- Prototyping: Hannes Coetzee ZS6BZP

Ground Station Requirements



- **A 2m/70cm 5 watt hand-held transceiver when the satellite is overhead**
- **For less ideal orbits an outside antenna such as ground planes or a two-band J-pole antenna is recommended. Transceiver power 10 – 20 watts**
- **For the ultimate results beams with azimuth and elevation control**

Frequencies

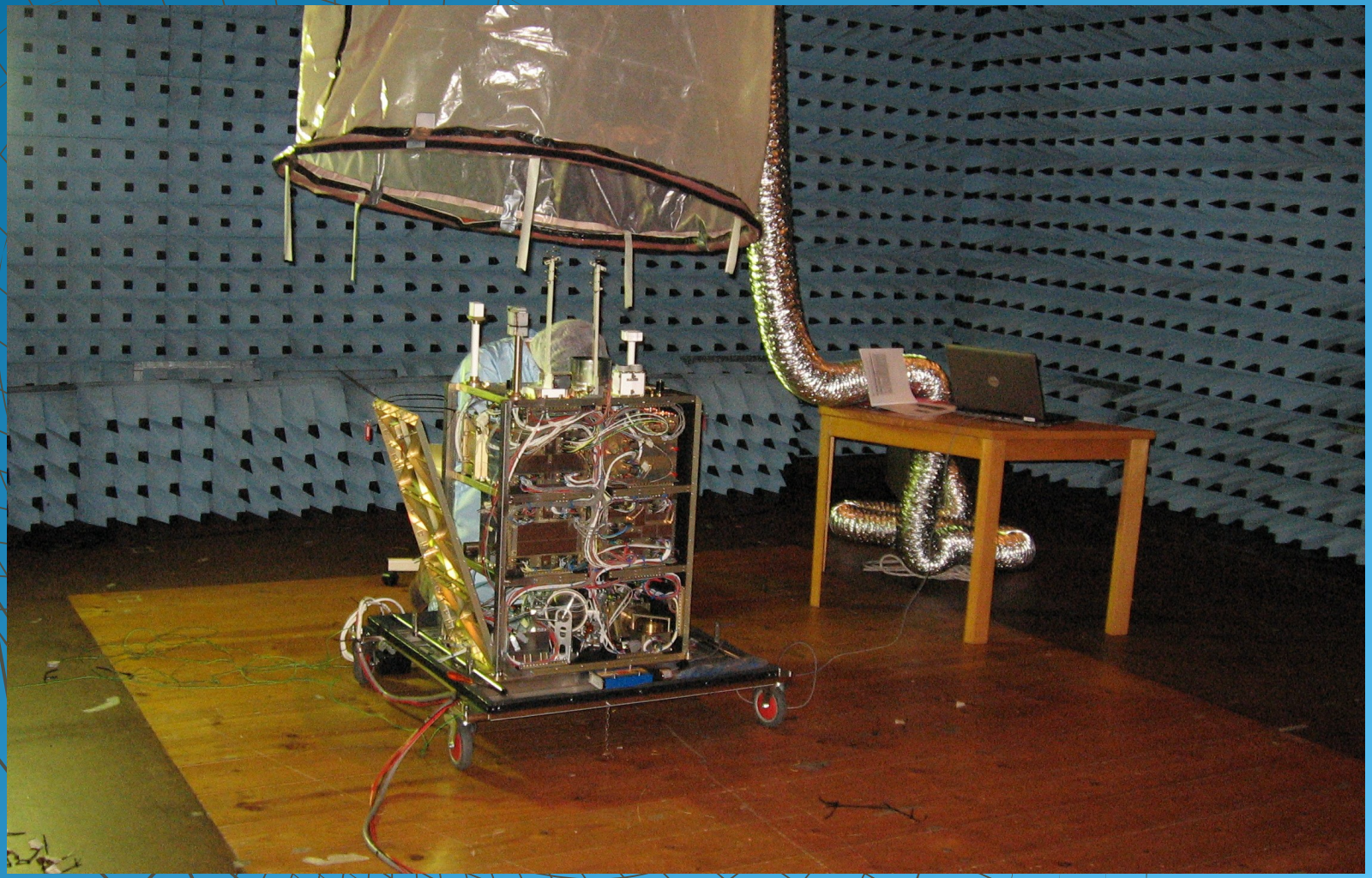


Mode VU FM voice Transponder and Parrot

Uplink 145,880 MHz

Downlink 435,350 MHz

All Systems go



Ready in Clean room to go

BEACON

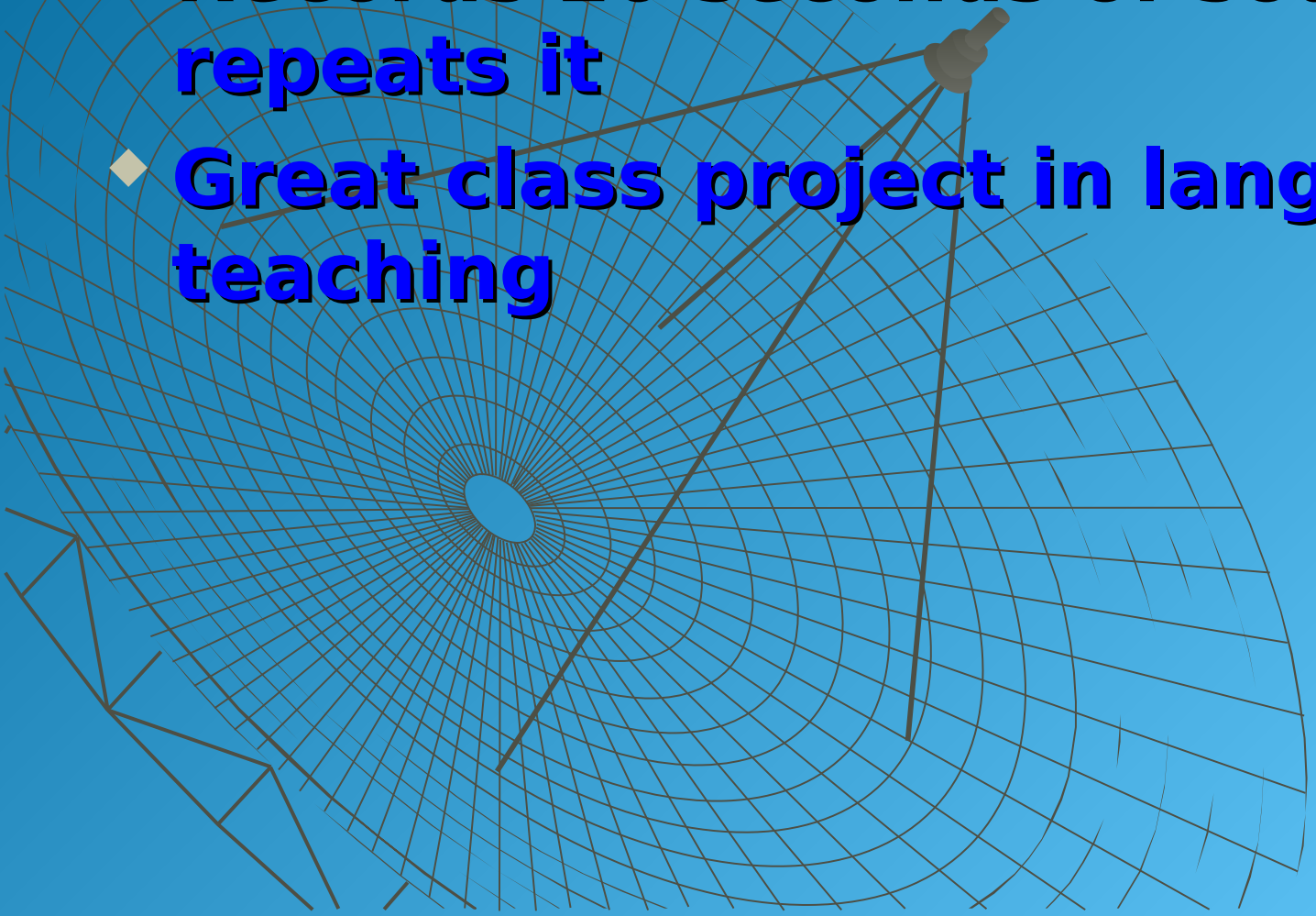
- The beacon message can be changed
- On launch there will be a pre-recorded beacon message
- The launch message was chosen from entries in a competition

Anton Coetzee

Kimberley Technical High School

Parrot Repeater

- Records 20 seconds of sound and repeats it
- Great class project in language teaching



Real Life Experience

- Taking satellites into the class room

Talking to an Astronaut

Will I ever get a chance to get into space?

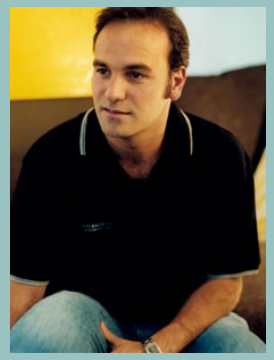
International Space Week

- Several schools were selected for the “Into Space with Amateur Radio Project" on 10 October
- Amateur Radio Stations are set up to connect learners to Mark Shuttleworth, Africa’s first astronaut

Space Essay Competition

- Learners were invited to write a 400 – 600 word essay on :“The future of Space in support of mankind”.
- Learners who entered the best essay will be chosen to talk with Mark Shuttleworth
- The best entry wins a laptop computer

Network



Mark in London

Conference Bridge

Control Station

REPEATER S

www.amsatsa.org.za

SA AMSAT is affiliated to the South African Radio League

The National Body for Amateur Radio in South Africa